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SECOND NOTE ON THE SPECTRUM OF o^2 *Eridani—C*

Since the note on the spectrum of the fainter component (*C*) of the double companion to o^2 *Eridani* appeared in the October number of these PUBLICATIONS[1], two additional spectrograms of this star have been procured with the 36-inch telescope, light 60° 1-prism spectrograph, and 6-inch camera. A recent unpublished micrometrical measure of the binary system *BC*, by Dr. Aitken, is here included for reference:

BC: 1921.79 $11^\circ.3$ $3''.54$ $9^m.0 \ldots\ldots\ldots 11^m.0$
(visual estimates)

The best plate of the series, that obtained on 1921 November 5, received an exposure of seven and a half hours. This shows not only the hydrogen lines $H\beta$, $H\gamma$, $H\delta$, and $H\epsilon$ bright, but also bright *H* and *K* lines of calcium. With the dispersion of the 6-inch camera, *H* and $H\epsilon$ obviously form a blend. The relative intensities of the several bright lines appearing on this spectrogram may be expressed on a scale of ten approximately as follows: $H\delta$, 10; $H\beta$, 8; $H\gamma$, 7; H-$H\epsilon$, 6; and *K*, 4. $H\delta$ and *K* are sharp, whereas $H\gamma$, H-$H\epsilon$, and $H\beta$ are broader.

The bands of titanium oxide most closely resemble those in a typical spectrum of class Mb, but on account of the presence of both the bright hydrogen and *H* and *K* lines, the spectrum of o^2 *Eridani —C* must be finally classified as Mdp. This is the second M-type star with bright *H* and *K* lines encountered to date.[2]

The emission lines of hydrogen and of calcium *H* and *K* are plainly visible also on an exposure of only four and a half hours' duration, secured on October 29th. In fact, on the first plate of this star, obtained thru clouds on October 7, and of hardly two hours' effective length, bright $H\beta$, $H\gamma$, and $H\delta$ can be discerned without difficulty.

A plate of component *B* was made with the 16-inch camera on October 30. From this negative, the spectrum has been classified as B9. The *K* line, characteristically of this spectral subdivision, is very narrow and inconspicuous, while $H\beta$ and $H\gamma$ have sharp centers surrounded by a peculiar diffuseness, and $H\delta$ and $H\epsilon$ are broad and hazy. The preceding classification is in good agreement with that (AO) derived by Dr. Adams[3], and that (A) listed in *The Henry Draper Catalogue*[4].

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[1] See p. 272.

[2] The first being the $73''$ 9.0^m companion to *Castor*, which, like o^2 *Eridani—C*, is a dwarf, class Mdp star (Adams and Joy, *Publ. A. S. P.*, 32, 158, 1920; *Mt. Wilson Contrib.*, No. 199, 39, 1921).

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THE SPIRAL NEBULA MESSIER 33

The two largest spirals recorded in the sky, the great nebula in *Andromeda* and the spiral in *Triangulum* present beautiful examples of the two great subdivisions of the spirals necessary in every attempt to classify these bodies, which show a greater variety among themselves than any other class of celestial objects. Photographs of Messier 33 (*Triangulum*) show some phenomena typical for many spirals of the same subdivision, which perhaps have been noted by observers, but still deserve to be pointed out. On small scale photographs the spiral appears as a bona fide nebulous object but photographed with large instruments especially the outer parts of the spiral arms seem to be resolved into numerous star-like objects. Many of these secondary nuclei look exactly like stars but a number of them have a soft appearance which has led Ritchey to call them nebulous stars. Now suppose the spiral consists of a great number of very distant stars; even on the largest scale photographs most of the stars will then be crowded together and give the impression of nebulous objects. Besides, the resolved stars are involved in what appears as a background of nebulosity that may be the vast number of unresolved bunches of faint stars; and thus the nebulous appearance of many of the secondary nuclei will be the more emphasized.

There is in the spiral structure a great number of dark lanes and it is to be noted that these do not always define the space between the spiral arms but many times go across them. Dr. Curtis raised the question whether there are whorls of dark matter between whorls of nebular matter and much pictorial evidence is in favor of this idea. Another question is: As the only difference between the rifts in Messier 33 and those in the Milky Way seems to be that the

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[3] *Publ. A. S. P.*, **26**, 198, 1914.
[4] See *H. D.* No. 26976, *Harvard Annals*, **92**, 28.